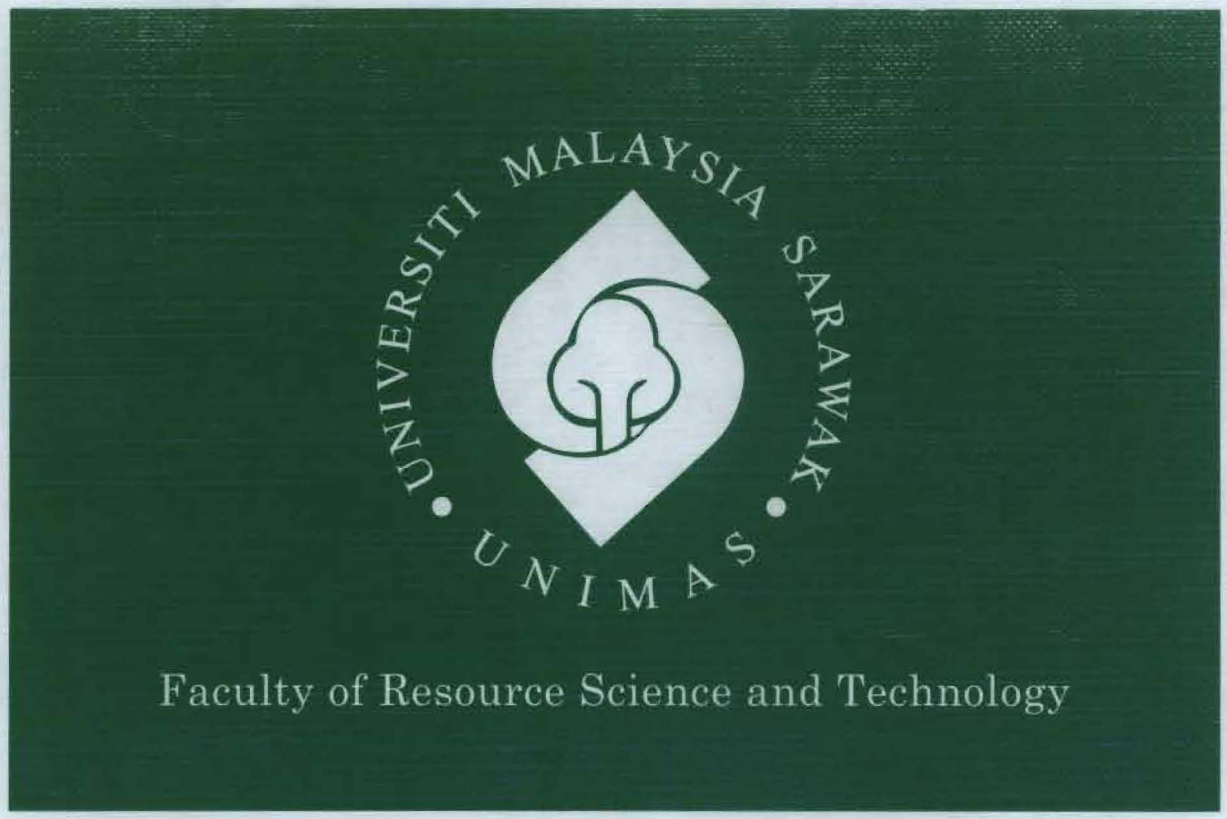

EFFECT OF DIFFERENT SHADING ON THE GROWTH PERFORMANCE OF ROSELLE (*Hibiscus sabdariffa L.*) SEEDLINGS

Siti Nur Sarah Bt Abdull Razak

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P.KHIDMAT MAKLUMAT AKADEMIK
UNIMAS
1000235141

SITI NUR SARAH BT ABDULL RAZAK

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Faculty of Resource Science and Technology
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APPROVAL SHEET

Name of candidate: Siti Nur Sarah Bt Abdull Razak

Matric no: 25108

Title of dissertation: Effect of Different Shading on the Growth Performance of Roselle (*Hibiscus sabdariffa* Linn.) Seedlings.

.....

(Prof. Dr. Hamsawi Sani)

Supervisor

.....

(Mr. Qammil Muzzammil)

Co-Supervisor

.....

(Dr. Siti Rubiah Zainudin)

Coordinator of Plant Resource Science and Management

Faculty of Resource Science and Technology, UNIMAS

DECLARATION

No portion of the work referred to this report has been submitted in support of an application for another degree of qualification of this or any other university or institution of higher learning.

Siti Nur Sarah Bt Abdull Razak (25108)

Programme of Plant Resource Science and Management

Department of Plant Science and Environmental Ecology

Faculty of Resource Science and Technology

Universiti Malaysia Sarawak

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CHAPTER 1.0
INTRODUCTION

Roselle (*Hibiscus sabdariffa.* Linn.) is commonly called Jamaica sorrel, Indian sorrel or red sorrel, is a dicotyledonous and autogamous plant cultivated in tropical and subtropical regions for its fleshy calyces, seeds, leaves and stems. Roselle is probably a native of West Africa and is now widely cultivated throughout the tropics and subtropics e.g. Sudan, China, Thailand, Egypt, Mexico and the West India (El-saidy *et al.,* 1992). According to Cobley (1968), the crop is cultivated throughout the India subcontinents, part of Asia, America, Australia and throughout Africa. However, the crop is most suited to tropical climates such as Malaysia.

Roselle is basically used for its fibers and fruits, then the latter being utilized for making jelly and preserves. In India, calyces are cultivated in producing beverages, jams sauces and food preserves. Roselle extract prepared from the dried calyces are rich in anthocyanins and could be used as a good source for producing a brilliant red colorant for many foods (Clydesdale *et al.,* 1979; Pouget *et al.,* 1990). The oil extracted from Roselle seed can be a substitute for castor oil while the residue is used in a fermented form as soap or cake. The leaves are used for soup and as a pot herb (Adigun, 2003).

Roselle also has same chemical and physical properties as jute in term of its softness and its color. According to Rao (1996), Roselle is grown in some regions for fiber and pulp obtained from its stems. The fibre also may be used as a substitute for jute in making burlap. Apart from that, Campese (1937) stated that well-prepared Roselle fiber can be woven into bed clothing, table linen and other articles for which cotton is used. According to him, 'navy and merchant

marine' are prefer to use this kind of fiber because they deteriorated little when wet and did not rot if left for a long time in salt or fresh water. Fishing nets made from this fiber were also extremely resistant and broke only under great strain. This is because Roselle fiber is twice as strong as jute and very resistant to sea water and can be spun without difficulty (Ettling, 1926). Campese also stated that fiber from young plants is suitable for the manufacture of paper.

Moreover, the calyx is used to produce drinks or tea due to high contents of anthocyanins (Mizukami *et al.,* 1988; 1989; Hong & Wrostland, 1990), amino acids and mineral salts (Cissé *et al.,* 2009). The extract prepared from edible calyces is an effective cure for intestinal and urinary infections. Its water extract is characterized by a brilliant red colorant and a good acid taste. There are several countries using Roselle as a natural medicine for treating hypertension (Faraji & Tarkhani, 1999), pyrexia and liver disorders (Chen *et al.,* 2003), microorganism growth limitation (Oboh & Elusiyam, 2004), as well as a diuretic, digestive and sedative (Akhindahunsi & Olaleye, 2003).

In folk medicine, it is also used to treat inflammatory disease (Dafallah & Al-Mustafa, 1996) and cancer (Chewonarin *et al.,* 1999). Anthocyanins, flavonols, protocatechuic acid, along with others, have been identified as contributors to the observation of medicinal effect of *H. sabdariffa* (Seca *et al.,* 2000). Consequently, the calyces have received industrial attention internationally. Moreover, Roselle is one of the most popular folk medicinal plants due to its colored and edible calyces which are also used in pharmaceutical and cosmetic industries. In addition, the seeds are subjected to a solid-state fermentation process which produces a meat substitute condiment known as *dawadawa-botso* in Nigeria, *bi-kalga* in Central Burkina and

datou in Mali. In rural populations, this condiment is mostly used in sauces accompanying cereals and pastas.

Roselle productions are popular because of the high potential due to various traditional and local agronomic practices. However, local farmers who have never experienced the effect of these agronomic practices on the productivity of Roselle are undertaking most of these practices. Good agronomic practices such as spacing, time of sowing and fertilizer application have been affiliated to high and economic yield potentials. However, the effects of these agronomic practices need to be monitored in order to identify the optimum range for high productivity. Studies on Roselle conducted in Malaysia are very scarce. Only a few studies have been done in terms of cultivation and commercial production. It is also very crucial to conduct the study of basic growth performance of *H. sabdariffa* Linn. Therefore the data obtained will be useful to cultivate these edible calyces for commercial purposes.

Since kenaf seed is more expensive to be cultivated for pulp, Roselle is regarded as a new crop with high potential for intensive cropping system owing to its multifunctional attributes.

Hence, the objectives of this study are as follows:

(i) To document the growth performance of *H. sabdariffa* under 0%, 50% and 75% shade.

(ii) To determine the biomass production of the *H. sabdariffa* under different shading.

CHAPTER 2.0
LITERATURE REVIEW

2.1 Scientific Classification of *Hibiscus sabdariffa* Linn.

Kingdom:	Plantae
Order:	Malvales
Family:	Malvaceae
Genus:	*Hibiscus*
Species:	*Hibiscus sabdariffa* L.

Hibiscus sabdariffa or Roselle has been variously called 'sorrel', red sorrel', East Indian sorrel plant' and 'thorny mallow'. In Malaysia it called as *Asam susur*. In Australia, it is known as the *Rosella* fruit. In India, it is popularly known as *Gongura* in Hindi and *Pulicha Keerai* in Tamil (Kuriyan *et al.,* 2010). *Chin baung* is called in Burma, while *Krajeab* commonly known for Roselle in Thailand, Bissapin Senegal, Guinea Bissau, Mali, Burkina Faso, Ghana, Congo and France. Yoruba's in Nigeria call the white variety *Isapa, Zoborodo* in Northern Nigeria, *Chaye-Torosh* in Iran, *Karkade* in Egypt, Saudi Arabia and Sudan. Other names are *Omutete* in Namibia, *Sorrel* in the Caribbean and in America Latin. *Flor de Jamaica* is called in Mexico, *Saril* in Panama, *Rosella* in Indonesia and *Luoshen Hua* in China. In Zambia the plant is called *Lumanda* in Gbemba, *Katolo* in Kikaonde and, *Wusi* in Chilunda. Most of the statements and descriptions concerning Roselle refer to a plant with red stems and calyces, the latter being used for culinary purposes.

2.2 Botanical Description of *Hibiscus sabdariffa* Linn.

Roselle (*Hibiscus sabdariffa* var. *sabdariffa*) is a tropical plant which belongs to the family Malvaceae. Roselle is an annual erect, bushy, herbaceous sub shrub, with smooth or slightly hairy, cylindrical, typically red stems. It can grow to 50-300 cm in height with a green or red colored stalk, and a red or pale yellow calyx that is edible (Brouk, 1975; Morton, 1987). Roselle is a tetraploid species with 2n = 4□ = 72 (Akpan, 2000).

The botany description of the Roselle that stated by Asolkar *et al.,* (1992), the leaves are 5-15 cm long and wide, suborbicular to elliptic in outline, base cuneate, margins serrate, lower leaves are ovate and undivided whereas the upper leaves palmately 3- to 5- lobed and glandular beneath (Plate 1). The flowers (Plate 4), borne singly in the leaf axils are up to 12.5 cm wide, solitary and axillaries. The pedicels are very short and jointed near the base. It is purple in color. The calyx is up to 3 cm long, red to dark purple, fleshy, lobes 9-10, lanceolate, 3-nerved and connate at base. The fruits are up to 2.5 cm in length and are surrounded by enlarged fleshy calyces containing 22-34 seeds per capsule (Plate 2 and Plate 3). The seed is dark brown in color, 4-6 cm long and about 0.025g in weight grows up to 2 m and leaves are varying in shape and size. It takes about six month to mature.